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ABSTRACT

Described is the Specialized Training Porgram for severely and profoundly retarded adults, an applied research effort to develop practical habilitation procedures, design programs to implement them, and evaluate the effectiveness of the programs using outcome criteria related to the quality of individual life. Development of the sheltered workshop program is discussed in terms of procedural development, vocational training issues, task acquisition, training efficiency, production setting issues, maintenance or increase in production rate, research needs in procedural development, organizational structure of the program model, the work flow system, the individualized treatment plan, and the management data system. Program evaluation is reported to indicate changes in participants such as increases in rates of social interactions, decreases in rates of self stimulation, and acquisition of self care and vocational skills. (DB)

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# Design of Vocational Habilitation Services for the Severely Retarded: The Specialized Training Program Model

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# Design of Vocational Habilitation Services for the Severely Retarded: The Specialized Training Program Model

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# Design of Vocational Habilitation Services for the Severely Retarded: The Specialized Training Program Model

The vocational future for developmentally disabled individuals can be predicted by projecting either the services and opportunities which exist now or those we would like, given the results of current research. A projection based on continuation of present services suggests that many developmentally disabled persons will continue to be excluded from training programs in which vocational skills might be developed and then barred from sheltered workshops because such skills were undeveloped. Without vocational options, these individuals will be removed from the economic mainstream and placed in programs which purport to provide therapy via field trips, childrens' games, and service club sympathy parties.

Projecting future vocational opportunities on the basis of what we would like involves deduction from social and professional values without limitations imposed by present practical constraints. There appears to be an emerging consensus of values which emphasizes the importance of living in normative situations, of developing individual skills, of increasing personal competence and choices, and of giving each individual the opportunity to take risks, to succeed, and to fail. The goals of future programs based on these values would include the ability of severely disabled persons to participate competently in the activities of a community around them. Remunerative work, as an important aspect of normal community activity, would certainly be a key aspect of that participation. (Work in our society appears to be alternately viewed as an unavoidable drudgery

and as a cornerstone of self esteem (Turkel, 1972), but one thing is certain. Work is normal.) Projecting current values at a broader level, we might expect to see the work of severely disabled persons taken seriously in manpower planning as society's labor resources are integrated with an appropriate technology (Schumaker, 1975).

Research suggests that this desirable future is possible now. Professional literature is replete with demonstrations that these adults can learn and perform a variety of difficult industrial and agricultural skills (Bellamy, Peterson, & Close, 1975; Clarke & Hermelin, 1955; Crosson, Note 1; Gold, 1976; Jacobs, 1976; Martin & Flexer, Note 2; Screven, Straka, & LaFond, 1971). In a future in which this research was systematically applied, developmentally disabled persons could receive organized vocational training and then enjoy remunerative occupation in either normal or structured vocational settings.

Thus, the potential vocational future of developmentally disabled individuals is considerably more bleak when projected from services which exist now than when projected from those which seem desirable and possible. The difference between these potential futures emphasizes the need to integrate into existing vocational services the procedures which appear possible and desirable from professional literature. Reports of effective vocational habilitation procedures have been available for some time, but these reports have not had a timely impact on community service programs. Therefore, applied research now seems needed which focuses on the

utilization of practical procedures to achieve vocational goals in community programs. The failure of most service programs to keep pace with research and demonstration results underscores the need to move beyond what Patterson (1969) has labeled the "Whoopie" stage in behavioral treatments. It no longer seems helpful to demonstrate a solution for an isolated problem of vocational training or supervision and then suggest that major changes in vocational habilitation services should occur as a result. Needed instead is a behavioral engineering approach to defining comprehensive habilitation and employment services. This approach should be characterized by:

(1) Efforts to increase the practicality and generalizability of habilitation procedures. Available procedures should be used systematically with a representative sample of individuals having a particular barrier to employment. Problems encountered in habilitation of that group would then provide an indication of the generality of the procedures and identify needed procedural improvements. Practical procedures will be those which produce long term vocational competence, which are useful with most individuals needing a particular service, and which are inexpensive enough to be utilized in normal community programs.

(2) Design of program structures which facilitate use of available procedures. As practical procedures are developed, attention should be turned to identification of effective organizational structures in which these procedures can and will be used. This will involve integration of training and supervision procedures with solutions to the many other practical problems faced by workshops. The utilization of available techniques by vocational programs can be influenced by type and availability of work,

staff skills, social service funding patterns, economic recession and inflation, availability of accurate behavioral and financial data, and requirements imposed by the Department of Labor, Commission on Accreditation of Rehabilitation Facilities, and Vocational Rehabilitation and Developmental Disabilities agencies. Program models are needed which facilitate use of effective techniques.

(3) Systematic program evaluation. After a comprehensive program structure is defined, its effects on the developmentally disabled individuals served should be evaluated, with attention to such variables as long term employment success, concurrent changes in social and community living skills, and the cost of comprehensive habilitation services. As Johnson and Bolstad (1973) suggested at an earlier Banff conference, this evaluation should be based on multiple data types and data sources to avoid errors inherent in more limited assessments.

The purpose of this paper is to describe an effort to apply such a behavioral engineering approach to the development of community vocational services. The Specialized Training Program was initiated in 1973 at the University of Oregon with the goal of increasing future vocational opportunities for severely and profoundly retarded adults in the Pacific Northwest. Our general strategy was one of demonstration and applied research. At the outset a small community workshop was established to provide vocational habilitation and employment services to the severely and profoundly retarded. As effective procedures were identified and integrated with other operational needs of the shop, a program model

evolved in which the defined procedures could be systematically used. This paper will describe the Specialized Training Program model by (1) reviewing our efforts to increase the practicality of habilitation procedures and (2) describing components of the program structure which evolved from the service and research programs.

## PROCEDURAL DEVELOPMENT

Research on the development of habilitation procedures occured within a community workshop which was designed to maximize the vocational skills and productivity of severely retarded adult participants. Because of the broad goals of the Specialized Training Program, the shop was also designed to increase applicability of findings to other vocational programs serving the severely retarded. This interest in applicability determined both the individuals who participated in the program and the work which they learned to perform. Workers were selected in a relatively random fashion from residents of Lane County, Oregon, who were thought to be representative of severely and profoundly retarded adults who were potential candidates for community vocational programs in the next few years.[2] The shop contracted for work tasks which had economic value in the northwest region, not just for tasks which appeared simple or theoretically interesting.

Then, given these particular workers and tasks, the shop began providing vocational habilitation services to increase individual vocational competence. The procedural problem was two-fold. First,

a set of training techniques was needed which would result in the acquisition of varied and difficult skills by quite severely handicapped adults. The second aspect of the problem was the need to design production supervision procedures which could be used after a task had been learned to maintain adequate work rates for an extended period of time. Both parts of the problem were approached with the assumption that vocational incompetence was simply a constellation of behavior deficits, each of which could be remediated through direct instruction, rather than a manifestation of limited potential or impaired intellectual functioning (Bijou, 1963; Lindsley, 1964; Meyerson, Michael, Mower, Osgood, & Staats, 1960).

Techniques derived from existing literature provided the program's first approximation of needed habilitation services. Previous research on operant conditioning, vocational skill development, contingency management, and methods of teaching severely handicapped individuals provided a set of treatment techniques which appeared applicable to our setting. As these were used with some success, service failures and problems became the focus of our research. Workers whose acquisition or performance of vocational tasks was problematic were studied individually in an effort to identify effective procedures which could be feasibly applied in community programs, given typical staff and equipment resources. Following Sidman's (1960) suggestion, we proceeded in the belief that (eventually) a general set of procedures would emerge, inductively, as a function of gathering detailed information on single subjects across conditions.

## Vocational Training Issues

To achieve vocational competence a worker must be able to perform requisite behaviors, often in a particular sequence and typically in response to specific changes in a work task. Further, this must be done without assistance and without errors. Procedures for teaching independent work skills involve accentuating antecedents and consequences of trainee behaviors, and gradually removing this support over time as desired response topographies or stimulus control is acquired. Available training techniques have been reviewed elsewhere (Bellamy, Inman, & Schwarz, 1977). Those initially used in the Specialized Training Program workshop included techniques to teach the necessary response topographies and techniques to bring these topographies under stimulus control. Briefly, there are four basic techniques which appear useful, separately or in combination, to teach a severely retarded worker response topographies of sufficient quality to complete a task: (a) shaping, in which successive approximations are differentially reinforced; (b) physical priming, in which the trainer physically moves the worker through the desired response; (c) modeling, in which the worker observes as the trainer performs the correct response and then is given a chance to perform the response independently; and (d) verbal directions, in which the trainer simply tells the worker wnat to do.

Once the worker has learned the topographies required by a task, it becomes necessary to teach which task-related stimuli occasion which responses. In general, there are four practical techniques for developing stimulus control: (a) differential reinforcement, which involves

reinforcing all members of a specified response class in the presence of particular stimulus conditions, (b) changing antecedent stimuli to add and then gradually reduce large cue differences on relevant stimulus dimensions, (c) changing task-related antecedent stimuli to add and then fade redundant cues which have salience for the trainee, and (d) fading out trainer assistance.

Task Acquisition

The first set of service problems encountered in the Specialized Training Program resulted from attempts to adapt the above procedures to the particular characteristics of our tasks and workers. Workers in the Specialized Training Program were for the most part without functional expressive or receptive language and were non-imitative. Many exhibited severe behavior disorders such as violent tantrums, withdrawal, high rates of self stimulation, public masturbation, psychotic talking, and inattentiveness to social stimuli. Tasks for which the Specialized Training Program contracted appeared exceptionally difficult by most workshop standards, involving manipulation of tiny parts, difficult form discriminations, a variety of tool use skills, and operant chains which took up to twenty minutes for normal workers to perform and required assembly of up to 52 separate parts.

As a result, our earliest research involved attempts to identify, document, and illustrate teaching procedures which were effective with particular tasks and workers. Bellamy, Peterson, and Close (1975) described a procedure for teaching assembly of a 19-piece cam switch actuator to two severely retarded men. Individual training began by

having the worker sit in front of the task while the trainer waited for him to attend to the task. The trainee was then given the opportunity to perform each step in sequence without assistance. After each correct step the worker was reinforced with social praise, edibles, or physical contact. Incorrect responses were followed by a correction procedure in which the worker was asked to repeat the step with assistance and then to perform the missed step independently. Assistance involved the use of both physical primes and verbal directions. During each trial subjects received training on approximately one-fourth of the task, until all four segments could be completed independently. The two trainees reached criterion, two consecutive perfect trials, in 89 and 39 training trials respectively. On the basis of this demonstrational data it was concluded that at least some severely retarded adults were capable of learning this difficult vocational task and, therefore, that professional expectations regarding vocational abilities of this population should be reevaluated.

In a subsequent study Hunter and Bellamy (1976) described the procedure used to teach three severely retarded women to construct a cable harness consisting of 11 wires and coaxial cables which were laced together by tying approximately 75 knots with an elastic cord. Training procedures involved providing the worker with an initial demonstration (model) and then an opportunity to complete each step independently. When this occurred, the response was reinforced. Incorrect responses were followed by a correction procedure in which the trainer modeled or physically primed the correct response and then gave the worker another chance to respond with less assistance.

Physical assistance and modeling were faded out over time, requiring the worker to become progressively more independent. The three subjects learned to construct the harness after 72, 35, and 18 hours of training. Although this illustration did not provide evidence for a functional relationship between training procedures and task acquisition, it did extend the utility of the training procedures to a task which appeared quite different from those reported in previous literature.

Another study by O'Neill and Bellamy (Note 3) was designed to demonstrate a functional relationship between a well defined set of training procedures and acquisition of a saw chain assembly. The task was divided into three segments. Training on each segment was continued until the worker performed all steps in that segment correctly in three consecutive probes. At the outset the trainer modeled the correct response and then asked the trainee to perform the step, providing differential consequences for correct and incorrect responses. As in the earlier demonstrations, correct responses were followed by compliments, physical contact, and small edibles. Incorrect responses were interrupted as soon as they occurred, the worker was backed up one step in the chain and assisted through the step, then allowed to respond as independently as possible.

Training was completed on the three segments in 28 hours and 40 minutes, 7 hours and 40 minutes, and 8 hours, respectively. Each of the segments was learned only after the training procedures were implemented for that segment. Thus there is strong evidence for a functional

relationship between these vocational training procedures and skill acquisition. The authors also noted that the subject acquired a few responses in segment three prior to training on that segment. Although the topography of these responses and the correlated stimuli were similar to steps taught in segments one and two, they were never reinforced directly. This generalization raised the issue of teaching generalized response classes, or operations (Becker, Engelmann, & Thomas, 1971), to improve the efficiency of vocational training.

As a group these illustrations also document the evolution of other refinements in training procedures which appeared useful in the Specialized Training Program. First, a somewhat clearer definition of a response unit emerged. Since performance of an operant chain involves a continuous series of movements under stimulus control, any segmenting of that chain appeared arbitrary. In previous research Gold (1972) had identified separate manipulation and discrimination "steps" in his task analysis. Crosson (Note 1) used as measurement units "discriminated operants," which referred to minute bits of behavior described topographically. The arbitrary but useful measure which we have begun to use is a subchain, somewhat larger than Crosson's unit, which is typically defined by a functional effect on the task being assembled.

Another general change in procedures has related to techniques for fading trainer assistance during training. Many training techniques published for use with the severely retarded suggest fading from physical to demonstrational to verbal assistance as the trainee gains proficiency

(see, for example, Lent, 1974). For many of our workers, however, specific types of cues appeared to have little or no stimulus control over behavior. Therefore an increasing emphasis was placed on fading within assistance modalities which appeared effective with individual workers, rather than across modalities. Thus, whether priming, modeling or verbal directions were used, fading was accomplished by reducing the specificity of the cues, rather than changing to another cue modality.

Training Efficiency

A second set of training issues which have arisen in the Specialized Training Program relates to the efficiency and cost of training. Given that many severely retarded adults can learn to perform work which has economic value in the Northwest, can they do this within the resources available to community vocational programs? Several contracts in our shop have been temporary jobs requiring rapid training and retraining of several workers. This raises both the issue of identifying specific techniques which are most efficient and that of developing training strategies which increase a worker's ability to learn successive tasks more readily.

The first of these issues was addressed in a study by Irvin and Bellamy (1977), which compared three techniques for teaching an assembly requiring a difficult visual discrimination. Three groups of seventeen severely retarded adults were taught to discriminate a slightly raised face of a hex nut by training procedures which involved (a) adding and reducing large cue differences on the relevant shape dimension;

(b) adding and fading a redundant color dimension, and (c) a combination of these two procedures. Significant differences between the groups on both trials and errors to criterion were obtained. For this task, the combined procedure was most efficient. The procedure involving a redundant color dimension was second, and that involving accentuation of the relevant shape dimension was the least efficient.

A second issue which appears related to training efficiency concerns the extent to which assistance modalities typically used in training function as effective discriminative stimuli for a trainee's responses. It could be hypothesized that training efficiency would be increased if a trainee were taught generalized skills, or operations, of responding to such cues as models, verbal directions, picture cues, etc., by emitting appropriate matching responses. In an exploratory study, Bellamy, Oliver and Oliver (Note 4) taught the operation of manipulating small parts to match samples to three severely retarded workers. The workers were taught match-to-sample responses to five classes of items: (a) non-discrimination items (flat and identical on both sides, so that any placement was a correct match); (b) up-down items; (c) directional items (needing correct rotation); (d) two dimensional items (up-down plus rotation); and (e) assembly items, in which two parts were fitted together to match a sample. Correct matches were differentially reinforced and incorrect responses were followed by a model and another opportunity to respond.

During non-discrimination training no improvement in matching to sample was evidenced during probes for any other item class. However,

as the up-down match to sample response was learned, all subjects performed correct matching responses to other up-down items that were never directly taught. Further, after training on the up-down items, two of the three subjects performed correctly on other classes of items which had not been taught. The use of a multiple baseline design supports the authors' contention that development of the sample matching operation was functionally related to the training techniques used. Of course, the relevance of the procedure to training efficiency must also be demonstrated by evaluating the effects of such teaching on subsequent vocational training.

## Production Setting Issues

Training is complete when the worker is performing at an acceptable rate, and the trainer has faded his or her proximity and attention such that correct responding is occuring under normal production conditions. At this point a new set of behavioral issues arise. Primary among these are: (a) development and maintenance of acceptable production rates and (b) maintenance of the quality of task-related responding.

The first approximation at dealing with production supervision issues in the Specialized Training Program was founded on basic contingency management research (Bandura, 1969; Bijou and Baer, 1961; Kazdin, & Bootzin, 1972). A production supervision system was established in which all staff attention was made contingent upon on-task behavior. A token economy using pennies as partial immediate payment for completed work was implemented, and a systematic observation system allowing

reliable measurement of on-task behavior, production rate, errors, and supervisor contacts was constructed. As workers met training criteria and entered the production setting, we noted that several exhibited gradual improvements in rate. A few workers even improved the efficiency of their production behavior by altering the response topographies developed in training. While these responses functioned as strong staff reinforcers they were not representative of all workers. All too often our production data indicated decreases in production rate, and in some cases increases in error rate. Fine grained observation of these workers taught us there are many more ways of working slowly than we had anticipated. As such, the research we have conducted with production behaviors has focused on the data received from these "slow" workers. Our objective has been to describe those variables functionally related to rate and quality of performance. Rate has been indexed in completed units per minute or minutes per unit. Quality of performance has been defined in terms of error frequency, performance of appropriate response topographies, and adequate stimulus control.

Maintenance or Increase in Production Rate

The most obvious objective of a production environment involves maintenance or increase in work rate. The degree of economic independence a worker achieves will be directly related to the rate at which s/he can produce in the workshop and the expense of supervision required to maintain that rate. Several variables may contribute to production rate, including worker characteristics (Windle, 1962; Cobb, 1969; Gold,

1973a) task characteristics (Gold, 1973b; Kahn & Burdett, 1967; Schroeder, 1972) and setting characteristics (Bellamy, 1976; Brown, Van Deventer, Perlmutter, Jones, & Sontag, 1972; Hunt & Zimmerman, 1970; Gordon, O'Conner, & Tizard, 1955). Research at the Specialized Training Program has focused primarily on setting characteristics. The studies described below address the effects of differential reinforcement, self-delivery of tokens, and medication on rate of production.

Differential reinforcement. One variable with potentially large effects on production rate is contingency management in the production setting. For example, Bellamy, Inman, and Yeates (Note 5) differentially reinforced high rates of production in a multiple baseline design across three workers. As part of a shop-wide token economy, each worker completing a unit of work normally received an immediate payment of one penny if the work passed a quality control inspection. During intervention, Bellamy, et al rewarded workers with two pennies and social praise if work was completed within a predetermined time limit, and one penny if the work took longer than the specified time. The subjects were all performing the same task, but at radically different rates Therefore, the criterion for each was produced by averaging his or her rate over the previous five days. This method of determining the criterion took into account individual differences, and provided a method of systematically reinforcing graduated increases in production rate. The intervention procedures resulted in marked increases in rate for all three subjects with two achieving near normal production rates. For the third worker the effects were less dramatic

and her rate was gradually decreasing when the program was terminated. It is possible that pennies, or the peanuts, raisins, seeds and nuts purchased with pennies, were not sufficiently powerful reinforcers for this worker. It is also possible that two pennies were not discriminable from or not significantly more reinforcing than one penny for this worker. It is nevertheless clear that differential reinforcement of higher rates of production is an effective method of dealing with rate problems for some retarded workers.

Self-delivered consequences. Management of contingencies in a production setting demands considerable skill and precision on the part of supervisors. Yet current financial constraints suggest that if workshops for severely retarded adults are to become commonplace, the number of supervisors will need to be kept to a minimum. One procedure which might reduce the demands placed on supervisory staff, and still maintain high levels of worker production is self-delivery of rewards by workers. A pilot study by Horner (Note 6) assessed the differential effects of self-delivery of pennies vs. supervisor delivery of pennies following completion of a unit of work. A single subject ABAB design was employed with each phase lasting approximately seven weeks. Supervisor contacts were held constant across all phases. The subject was trained to self-evaluate correct vs. incorrect work, and self-deliver pennies for correct work during a single three hour training session. The results indicated that (a) the severely retarded worker was able to accurately and correctly self-deliver reward for extended time periods, and (b) self delivery of pennies was not only

an effective method of maintaining production rate, but a useful technique for increasing rate. Further analysis of self-delivery using a multiple baseline design with a single subject and three tasks is currently in progress.

Effects of medication. Another production rate issue which applies directly to workshops employing severely retarded workers is the effects of psychotropic drugs on worker productivity. In an unplanned, ABA, double blind study Lahren (Note 7) found that .09 Mg./Kg. of Haldol delivered twice a day in a worker's home environment effectively halved production rate. As the vocational potential of severely retarded adults gains increased status, the widespread use of drugs to control behavior will need to be closely examined.

Maintenance of Stimulus Control

Intimately related to rate of responding are the quality and independence of each response in the operant chain. A worker must be able to perform task related behaviors accurately, and without extensive contact from production supervisors. This demands that responses be under control of stimuli within the task. Therefore, maintenance of stimulus control in the production setting is essential for quality performance. Problems related to stimulus control generally fall under one of three categories: a) The quality of responding deteriorates and errors occur, b) The worker continues to perform the chain, but adds superstitious subchains, or (c) The operant chain itself breaks down.

Deterioration in Response Quality

For vocational skills to be a viable part of the worker's repertoire s/he must be able to perform in the production setting with a minimum number

error. Skills acquired in training should allow a worker to assemble products which meet the same quality specifications used in industry. This objective frequently requires that a response be performed in a very precise manner. If a wire is to be cut to a specified length, and the tolerance for error is only one millimeter, then the angle at which the cutting tool is held may be critical. During training the specific topography of this response (i.e., holding the tool at a particular angle) is identified and trained. In the production setting it is imperative that the quality of the response not deteriorate.

A 27-year old woman at the Specialized Training Program had been trained to paste cushioning tape in the four corners of a small chimney-like apparatus used by Tektronics, Inc. to shield electronic elements from heat. To be effective, the cushioning tape had to be placed exactly in the corners of the heat shield chimney. During training and the first week of production the worker performed the task with a high level of accuracy. During later weeks, however, the placement of the tapes became more erratic. A correction procedure in which the worker was shown her errors, and asked to redo them did not decrease the overall frequency of errors. A second intervention involving re-training at the production workbench utilized a CRF schedule of praise for each correctly placed tape, and required that a missed step be redone immediately. As accuracy improved, the schedule of reinforcement was leaned out to approximate that normally delivered by production supervisors, and the trainer faded her proximity and attention to that of other production supervisors.

Data from a 10-day baseline period indicated the worker was producing at a rate of .018 shields per minute. Of the four tapes placed per shield she was averaging two incorrect placements. During the last 5 days of the 27-day intervention the worker assembled shields at an average of .10 per minute with only .07 errors per shield. Due to completion of the shield contract the follow-up period lasted only 10 days. This short maintenance period indicated a slight decrease in rate to .07 shields per minute, but a retention of near errorless performance.

Superstitious subchains. Superstitious subchains occur when a worker adds extraneous movements to a specific step or steps in the chain, but is still able to complete the task without errors. Frequently these subchains are not observed by production supervisors and are inadvertently strengthened when a terminal reinforcer is delivered at the end of a chain. Superstitious subchains can be identified by watching a worker perform his or her task several times. If a specific set of responses, not related to the task, consistently occur at a particular point in the chain, those responses are a superstitious subchain. These subchains decrease a worker's rate of production and reduce his or her economic independence.

Two workers at the Specialized Training Program engaged in extensive self-stimulatory behavior during specific steps in assembly of production tasks. One worker would either wave his hands along either side of his head while rocking forward two or three times, or make a loud noise by putting the fleshy part of his hand (behind the thumb) in his mouth and blowing. The second worker pulled at her cheeks and chin while rocking.

Elimination of the superstitious subchains with both workers was achieved through implementation of overcorrection procedures (Azrin & Fox, 1970; Fox & Azrin, 1973). Each time a worker engaged in a targeted subchain s/he was instructed to hold his or her hands in specific postures for three minutes, then return to the task. An AB design with worker one and an ABAB design with worker two were used to assess the effects of the overcorrection procedure. Frequency of the target behaviors within the operant chain and rate of production served as dependent measures. The data, reported by Rose (Note 8), showed significant improvements on both dependent measures during intervention. Each worker performed at an improved rate, and without superstitious subchains before treatment was terminated. Worker one has maintained the gains achieved during intervention; worker two still performs self-stimulatory subchains, but at a lower rate than during baseline. These data suggest that (a) overcorrection may be one method of eliminating superstitious subchains; and (b) further research is necessary to determine variables affecting maintenance of stimulus control following elimination of superstitious subchains.

Breakdown of the operant chain. The third issue related to maintenance of stimulus control is characterized by workers who simply stop working. In a surprisingly few number of trials, stimuli in the task or production setting can come to set the occasion for off-task responding rather than on-task responding. A high rate of off-task behavior may be an index that neither the reinforcers delivered at the end of the chain, nor those delivered for being on-task, are powerful enough, or delivered frequently enough, to maintain responding.

One variable with potential effects on off-task behaviors and resulting productivity is supervisor contact. Bellamy, Peterson, and Close (1975) used a single subject design to assess the effects of two types of supervisor contact on production rate. Supervisors delivered contact either as a command to return to work when the worker was off task, or as praise for on-task behavior. Both approaches were effective in increasing the worker's production rate above baseline levels.

## Research Needs in Procedural Development

This series of investigations relating to acquisition and performance of vocational skills provides an overview of the practical issues encountered in vocational programming for a group of severely and profoundly retarded adults. Additional research needs are apparent both in continuing practical problems and in questions which are raised by the studies themselves.

We do not have a systematic way of breaking down operant chains into teachable units (functional subchains) so as to maximize training efficiency. Obviously, the decision of how to segment an operant chain into component steps is to some extent a function of the task itself since its characteristics determine what the final product must look like. But our experience suggests that training is easier if we modify our task analyses over time in order to accommodate individual differences as they emerge during training. More research is needed to systematize this decision process. Perhaps the research on operations is a step in the right direction.

Another research issue is how to teach functional subchains to each and every worker. Contrary to our expectations, we have been unable to

increase one worker's competence level to a point where he can work in a production setting without some degree of supervisor assistance. This clearly indicates the need to further refine our training procedures. Specifically, it points out the need to develop the means to fade out trainer assistance once the worker can perform a task. Again, some general way must be found to reduce trainer assistance either within or between modalities, but some flexibility must be built into the system to accommodate individual differences.

The issue of teaching "operations" deserves careful attention. The studies to date indicate it is possible to teach response classes or operations to severely and profoundly retarded adults, but it remains to be shown what affect this has upon the efficiency of subsequent training. Preliminary observations in our shop are encouraging, but much more research is needed before firm conclusions can be reached.

Another set of problems which deserves consideration has to do with long term maintenance of stimulus control in the production setting. The needed research would provide a systematic basis for combining antecedent, consequence, and contingency manipulations in the production setting to minimize assembly errors and behaviors incompatible with production.

Extensive as these applied research needs are, the progress made to date does support a cautious optimism. There is little reason to suggest that extension of currently available procedures to other individuals, other tasks and other settings should not be approached in the same pragmatic fashion that has produced current successes.

## THE SPECIALIZED TRAINING PROGRAM MODEL

Despite remaining questions about habilitation procedures, it is clear that many severely and profoundly retarded adults can function adequately in vocational settings. Procedures are available for vocational training and production supervision which can result in vocational competence. However, the availability of some vocational training procedures during the last twenty years (Clarke & Hermelin, 1955; Crosson, Note 1; Gold & Barclay, 1973a) has not resulted in dramatic expansion of vocational opportunities for the severely retarded. It thus seems unlikely that improvements in these procedures will necessarily produce a future in which severely retarded persons have vocational options.

Therefore, the second phase of our work has been an effort to identify organizational structures which facilitated use of those procedures which had been effective with our workers. The Specialized Training Program model which resulted is a comprehensive organizational plan for the operation of small community workshops for severely retarded adults. A program using this model will function both as a small business and as an individual treatment center. As a treatment center, the program's goals will include (a) maximizing individual skills and adaptive behaviors; (b) increasing each individual's ability to participate competently in community life; (c) maximizing individual productivity and earnings; and (d) increasing individual options. As a small business, the model program's goals will be (a) money, (b) money, and (c) money (earnings; reduction of public support; maintenance of a stable, well trained work

force; sale of products; reduction of overhead expenses; and continuing viability of the business under changing economic conditions). The model is described in the following sections by elaborating four major components: the organizational structure, the work flow system, the approach to individual treatment, and the management data system.

## Organizational Structure

Administrative characteristics of many sheltered workshops appear to present a number of barriers to habilitation and employment of severely and profoundly retarded adults. The first is the relatively high cost of required administrative and professional staff. Sales persons, counselors, administrators, and bookkeepers are essential to current shop operation, but represent such a large proportion of the budget of most workshops that individuals who are directly responsible for training and supervision are seldom well paid, may have few of the competencies needed to teach skills to severely handicapped persons, and frequently are employed for only brief periods. Another important barrier to inclusion of severely retarded individuals in sheltered workshops is lack of adequate contracts. Work which is available locally, especially in rural areas and small towns, is seldom of sufficient volume and often involes a predominance of short-term jobs which require frequent retraining of workers.

The developing structure of the Specialized Training Program is an attempt to alleviate these organizational barriers to habilitation of the severely retarded. The program may be best described as a franchise, without the implied profit orientation. Independent small programs

work under contract with a core staff to provide vocational training and employment to severely retarded adults. Currently, each of three model programs uses standardized procedures to serve 10-15 adults. The contract between each model program and the core staff insures utilization of defined procedures and participation in program evaluation and specifies services to be received from the core staff.

The core staff at the University of Oregon provides a variety of professional and administrative services to model programs. This group assists communities in the development of programs which use the model and provides technical assistance to model programs on individual treatment procedures, sales, engineering, and program management. The core staff operates a data support service which generates needed reports from individual treatment, financial and job records. Preservice training for model program staff persons, research on procedural development, public information and information exchange among sites are also major responsibilities.

If program evaluation activities support the current structure, the core staff could be the basis for development of a small corporate group which provides a means of sharing some professional and administrative overhead among several model shops. This should increase the proportion of each shop's budget which can be concentrated on procedural rather than administrative program components. Programs using the model thus could meet overhead expenses without being as large as many community workshops. The smaller size would reduce the amount of work which is needed from area business, thus increasing the likelihood of obtaining

appropriate contracts. In addition a sales capacity in the corporate group could reduce the dependence of individual shops on local business conditions through a coordinated regionwide sales effort.

The Specialized Training Program model can be established as an independent not-for-profit corporation, as an independent division in an existing sheltered workshop, or within an industry which wishes to employ severely retarded persons. In each situation, three staff persons are recruited jointly by the program and the core staff, trained by the core staff, and given responsibility for overall program operation using the model's procedures.

Model sites are established in communities where appropriate staff can be recruited, contract opportunities are available and capitalization for initial years is possible. Most programs receive full funding from developmental disabilities and vocational rehabilitation agencies during initial years. As worker skills increase, reduction in this support is expected as a function of increasing sales volume and decreasing cost of sales.

## Work Flow System

The purpose of the work flow system is to combine sound business management with the habilitation procedures supported in applied research with the severely retarded. At each stage of production, organizational decisions are made which combine normal business procedures with specific techniques that appear useful with this population of workers.

Work is selected for its availability and economic value rather than its simplicity or theoretical interest. Crosson's (1969) suggestion

that workshops "find ways" to teach available work rather than "find work" which employees can already perform provides a useful anecdote for low professional expectations about worker abilities. Of course, the skills of a work force must be increased over time, and some potential tasks may be considerably more profitable after sophisticated skills are developed. Some considerations in determining the feasibility of a potential contract are its income potential, the required floor space, required machinery and equipment, anticipated shipping costs, the expected duration of the customer's need, and the lead time which could be used to provide needed training.

After a potential job is identified, a task planning committee meets to estimate the cost of building the product; to determine the method and sequence of assembly; to identify and price needed tools, fixtures and supplies; to define job stations; to select individual workers for training; and to set time standards and pay rates for the task. Decisions made by the task planning committee typically involve (a) opting for longer rather than shorter cycle times (Levy, Pomeranz, & Gold, 1977); (b) relying on fixtures which increase movement efficiency rather than fixtures which facilitate training but impede rapid production; (c) establishing assembly sequences which facilitate visual quality control; and (d) structuring tasks to maximize the use of generalized skills already in the repertoires of workers.

A task analysis of each task or major component is then conducted by an assigned trainer. This involves a breakdown of the job into smaller functional steps or subchains. The task analysis results in

a training data sheet which lists the subchains sequentially, defining the task-produced discriminative stimulus and the required response for each subchain. The data sheet is constructed following the recommendation of Saunders and Koplik (1975), and used to collect acquisition data during training.

Vocational training is conducted on an individual basis and continues until the required response topographies are established and brought under stimulus control of task-related cues. Training is conducted in the production setting a few feet away from other production employees. After workers are able to perform the task independently, they move with the trainer to an assigned workbench, where the trainer's presence is gradually faded.

The production setting is designed to maintain skills developed during training and to change rates of work and work related behaviors so that normal productivity results. Two supervisors are responsible for fourteen production workers, who work individually on assigned tasks. Supervisors insure that needed parts are available; provide social consequences for task attending and task completion; check quality of all products as they are completed; maintain records of productivity, task attending, and supervisor contacts with workers; and manage a token economy in which money is delivered on fixed ratio schedules for completion of task units. The money serves as a partial immediate payment for work completed, and is exchanged for food items during breaks.

Continuous quality control procedures are integrated into the production process. Each completed product is checked for quality

criteria listed at the work bench before the worker receives partial payment. Errors are immediately corrected, categorized, and recorded. A second quality check is made on a subset of products in each order immediately prior to shipping.

## Individualized Treatment Plan

The purpose of this component of the Specialized Training Program is to increase the personal options of each worker in employment and community settings by maximizing his or her vocational skills and adaptive behaviors. The general approach to treatment is to focus first on work and work related behaviors. Programs addressing non-vocational behaviors are developed, but these usually occur when some vocational training is completed, when additional staff resources are available, or when a particular worker's non-vocational skill deficits appear to jeopardize continued community involvement. Programs are designed so that workers receive needed training and treatment in a manner most like that of other adults in the community, i.e., as competent, employed adults, not as children in a simulated day-long classroom. Therefore, use is made of generic community services whenever these are available, rather than providing all needed services in the vocational program.

Individual treatment plans are written by a programming committee to specify goals for each four-month period. These plans identify objectives in areas of work productivity, vocational training, and non-vocational skill development. Treatment objectives are developed with input from as many persons concerned with the individual's welfare as possible. The objectives specify the performance expected in the

worker's natural environment, as well as the potential discriminative stimuli and maintaining contingencies in that environment.

The defined treatment objectives may be reached by any of several possible approaches. Rates of many behaviors are changed to desired levels through contingent use of normal daily interactions with staff members. A contingent environment is purposefully maintained in which access to social interactions with a staff member is available only when the worker's behavior is considered normative by that staff person. When the contingent environment of the workshop is unsuccessful or unrealistic, formal programs are written by the programming committee. These programs operationally define the target behavior, specify antecedent or consequent procedures for staff, outline data collection procedures, and set criteria for program termination or change. A standardized format for recording programs and program data facilitates communication among staff members and between the site and core staffs. Formal treatment programs in the Specialized Training Program have been designed for such diverse behaviors as posture improvement, construction of jigsaw puzzles, walking without support, frequency of tantrums, self stimulation, hitting staff, stealing food, nonverbal communication, and eating.

A problematic aspect of individual treatment results from the severe communication deficits of most workers. Many are unable either to participate meaningfully in the development of treatment goals or to give informed consent to intervention procedures (Horner, Note 9). Therefore, a volunteer program review committee is asked to review treatment objectives and procedures. Composed of interested individuals

from the community, the committee serves as an advocate for workers' civil rights.

## Management Data System

The standardized data system used in the model programs is designed to provide outcome information related to each major program objective. As a business, a program must have accessible records of its financial position and be able to evaluate the impact of a variety of circumstances on that position. As a treatment center, a model program must be able to demonstrate accountability through objective feedback concerning individual skill development, productivity and adaptive behavior changes.

The data system is a response to several considerations. The first relates to the quality of the resulting measures. Insofar as possible events and decisions are recorded at the time they occur, and the recording process is descriptive rather than interpretative. Further, events of interest are either continuously recorded (e.g., production rate) or are recorded during sufficient time samples that a stable or reliable score results (Johnson & Bolstad, 1973).

A second consideration in the development of the data system was the speed and organization of feedback to staff persons (Panyan, Boozer, & Morris, 1970; Quilitch, 1975). For example, production rate data provides the needed payroll information, but with slightly different display can also provide the supervision staff with a means of monitoring individual productivity. A final consideration is staff time required for data-related activities. The system was designed to maximize efficiency of recording by utilizing data support services from the core staff.

Inputs to the data system derive from several aspects of site operations, including production records of tasks completed by each worker and time required for completion; worker on-task behavior in production; number of staff contacts each production worker receives; amount of individual training given each worker; staff time tracking records, information on jobs to be completed; invoices; financial ledger information; and records of the onset and termination of behavioral treatments. Data processing at the University of Oregon produces several reports from this information.

Weekly and monthly worker reports detail and summarize each worker's production activities. Data are reported for each of the tasks the worker was assigned, including the amount of time worked, the industrial time standard, earnings, rate of staff contacts, on-task behaviors, and other targeted behaviors. The reports provide the basis for payroll computations and for evaluation supervision procedures designed to increase work rate or change rates of other behaviors in the production setting. The monthly report also apportions program expenses and income among individual workers, providing an empirical basis for training fees, subsidies, and cost benefit analysis. These data should eventually provide an empirical basis for projecting costs of habilitation programs for the severely retarded.

Other monthly reports provide financial data for budget management and evaluation of contracts. A listing of shop expenses and income is organized according to budget categories and displayed for comparison with annual projections. These are combined with staff costs to provide

an analysis of staff, material, worker and overhead costs. The report is used both as feedback to site staff, and as a useful index in planning for future contracts.

Does the data system work? Tentatively, yes. Observer agreement data are collected at set intervals on each data input form, and these suggest that recording errors are minimal. Evaluations of other aspects of the data system are just beginning, with attention to such variables as delays involved in using mail service, types of errors recorded at data entry, reported problems with printouts, etc. No doubt the system will be refined as these measures become available.

## Structural Research Needs

Current components of the Specialized Training Program model represent an application of available research on environmental design in day care centers (Doke & Risely, 1972; LeLaurin & Risley, 1972; Twardosz, Cataldo, & Risley, 1974) and institutions (Boles & Bible, 1977) to the structuring of sheltered work settings. As was our approach with habilitation procedures, the initial organization is viewed only as a first approximation. Research is currently underway to evaluate and revise model components by focusing on operational areas which appear problematic. Of immediate concern is evaluation of alternative staffing patterns and physical layouts on both the use of habilitation procedures and the productivity and social behaviors of workers.

## Program Evaluation

The particular combination of habilitation procedures and organizational structures which now comprise the Specialized Training Program model may be

an appropriate method of providing community services to an increasing population of severely retarded adults. However, despite the generally inductive origin of the model in actual service problems, its overall utility should also be established. The question of interest is whether participation in the model programs results in measurable changes in individual workers which reflect increases in the quality of their daily lives.

Although operational definition of quality of life is well beyond the scope of this paper, there does appear to be some agreement on relevant values concerning normalization (Nirje, 1969; Wolfensberger, 1972), the development of individual competencies (Roos, 1975; Edmonson, 1974), and the availability of options for social contact. Program evaluation efforts have revealed several changes in participants in the Specialized Training Program which seem related to these values, including increases in rates of social interactions and engagement with objects in the environment, decreases in rates of self stimulation and aggression, and acquisition of a variety of self care and vocational skills (Bellamy, 1975; Close, 1977). For most workers, however, these changes are correlated not only with participation in the workshop, but also with placement outside an institution and involvement in a small group home program.

Therefore, a current research program is designed to evaluate the effects of participation in a model workshop on several aspects of individual life. Consistent with a multiple baseline design, model programs are beginning at eight month intervals in various towns in the Northwest. Dependent measures will result from a multiple assessment

program which utilizes (a) naturalistic observation of behavior during unstructured leisure time in the workers' residences; (b) an adjective rating scale to assess labeling behaviors of important others in the living situation; (c) the Adaptive Behavior Scale (Nihira, Foster, Shellhaas, & Leland, 1974 ) as a measure of skill acquisition; and (d) direct measures of performance in the work setting. The utility of the program model described here should eventually be assessed on the basis of these and similar dependent variables which appear related to changes in the quality of participants' lives.

## SUMMARY AND CONCLUSIONS

When it is projected from currently available services, the vocational future for developmentally disabled adults appears bleak. Since work seems to be both a desirable and possible goal for many of these individuals, concerted effort does appear warranted in the present to avoid this predictable future. What is needed, it has been argued in this chapter, are applied research efforts which seek to develop practical habilitation procedures, design programs to implement them, and evaluate the effectiveness of the programs, using outcome criteria related to the quality of individual life.

The work of the Specialized Training Program during the last few years represents one approach to this task. Focusing on vocational habilitation of the severely and profoundly retarded, this program has addressed problems of procedural development and program organization through systematic study of service problems. We have devoted considerable time and energy in an effort to understand and subsequently control

variables that are powerful enough to increase competent work behaviors. While the results to date do not provide unequivocal support for an Itardian optimism, they do support the contention that many barriers to employment of the severely retarded can be overcome through careful design of vocational training and performance environments.

## Footnotes

[1] G. Thomas Bellamy, Ph.D., is Director, Dean P. Inman, Ph.D. is Training Coordinator, and Robert H. Horner, M.S., is Program Coordinator, Specialized Training Program, University of Oregon.

[2] A total of 18 adults meeting these selection criteria have been admitted to the program. Six were accepted in the order of referral, and represent all known members of the defined population who were receiving no community services, and who were within commuting distance of the workshop. Five additional participants were selected randomly from members of the defined group who resided in a large state institution. An additional seven adults have been subsequently accepted as consecutive referrals from the state's three institutions. Four participants have been lost. Two were returned to institutional care after dangerously aggressive behaviors eliminated their community residence options, and two died after inclusion in the program.

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